Institute of Actuaries of India

May 2010 EXAMINATION

Subject ST4 — Pensions & other Employee Benefits
Specialist Technical

Indicative Solution

A 1

a. The Actuarial liability for active members either at the valuation date or as at the end of a control period assuming the scheme will be discontinued at that date. The benefits should be based on the scheme rules before any reduction applied through any wind up rule or priority rules, if there is a shortfall.

b. An asset allocation strategy used in a defined contribution scheme where the member's investments are adjusted depending on age and term to retirement. Typically the assets are switched from equities to bonds and cash the closer the member is to retirement.

c. The process of a member exchanging or giving up all or part of the benefit for cash lump sum. However, commutation can also be used to refer to exchange of part of his pension for a higher dependant's pension payable on death of the retiree.

d. In the case of a pension plan, the period during which an employee does not fully meet the eligibility criteria for membership of the scheme. In the case of a sickness benefit it is the period of sickness that must elapse before the benefit becomes payable.

e. The level of insurance cover (under a group death or disability plan) under which an individual member would not be asked to provide any evidence of health before being accepted for cover.

	[5]

A 2

(i)   - **Employer**
         - Cost effective in the long run
         - Flexible to adapt to employment needs
         - Rewards key staff
         - Cost effective and low risk administration
         - Integration with State Benefits
         - Competitive amongst peer companies (attraction and retention tool)
         - Share some risk and cost with employees
         - Minimum legislative risk
         - Easy to understand and valued by employees
         - Stable costs and cashflow requirement
         - **Employee**
         - Predictable benefits
         - Portable
         - Flexibility in choice of benefit
         - Easy to understand
         - Provides protection to dependants
         - Good early leaver benefit
         - Good retirement benefit
         - Minimum cost
         - Flexible for working patterns
         - Share in good performance of the scheme (e.g. investment returns, other surplus)

	[5]

A 3   i. **Advantages:**

- ✓ Administration saving – no need to run a pensioner payroll
- ✓ Buy out terms may be relatively cheap at retirement
- ✓ Operating a scheme that is heavily weighted with pensioner liabilities can cause difficulties – the sponsor's contribution rate can become volatile if the payroll decreases in relative size to total liabilities. It may be easier to buy out the pensioner liabilities and run a much smaller scheme
- ✓ No investment mortality or expense risk remains with the scheme

  Disadvantages:

- ➢ Not as easy to keep contact with pensioners – no automatic communication channel
- ➢ Awarding discretionary pension increases is problematic – either additional pension paid each year from the scheme or the scheme has to buy out another tranche of pension
- ➢ The scheme loses any investment or mortality profit
- ➢ Buy out terms may be expensive at the point a member retires
- ➢ Buy out costs include expense costs and a contribution towards profit
- ➢ Can be difficult to plan funding of the scheme as annuity costs can be volatile
- ➢ May present the scheme with cash flow problems as 100% of the cost of the pension must be found at retirement
- ➢ Investment constraints due to the need to realise assets as a retirement approaches

  i.   Investment Policy

   The term of the liabilities is shorter as it effectively ceases at retirement.
   Some issues regarding matching:
- • Annuity prices are basically driven by the bonds/gilts markets. The scheme will need to consider assets that match annuity prices at retirement eg conventional and/or index linked gilts
- • Some cash may also be necessary depending on whether retirees exercise their tax free cash option
- • The degree of matching depends on the scheme's level of funding and will be less of an issue the more surplus funds exist

   The scheme may need a higher proportion of in market/liquid assets. Assets may have to be realised to supplement any positive cash flow into the scheme when securing a pensioner's benefits. This will depend on the scheme's cash flow position.

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A 4

- ✓ The model can project, for a given investment policy, statistics (mean, standard deviation, percentiles) about future financial progress of the scheme over the planning horizon.
- ✓ This can cover matters such as:
  - • ongoing funding levels;
  - • discontinuance solvency (e.g. MFR);
  - • contribution requirements; or
  - • pension expense for company accounting.
- ✓ The model can compare the impact of using different investment strategies.
- ✓ An optimisation process can be used to derive the "best" investment strategy i.e. the mix of assets which produces the "best" projected results for a given level of risk.
- ✓ In this context, best might mean lowest future contributions, lowest risk of insolvency or some other measure, depending on the objectives of the trustees or company.
- ✓ The model can produce information about future cash flow requirements for the scheme, to help identify times when the scheme is likely to have to realise assets.

Limitations:
- ➢ The economic model extrapolates from historical data to derive assumptions about future events.
- ➢ The outputs from the model may be sensitive to small changes to the assumptions, and this feature should be tested.
- ➢ The model will be particularly sensitive to small changes if the model attempts to model separately many different asset classes. For this reason, models are used to set benchmark asset allocations between broad classes.

➢ Implementation of asset selection is then the responsibility of the fund manager(s), whose ability to add value may be measured against the return that was achievable on the benchmark allocation. ➢ The process of fitting an economic model to data is not perfect, and the model will invariably involve some simplifications. ➢ The outputs from the model should be treated as providing insight rather than as a true optimisation tool, and need to be tested to ensure that they accord with common sense. ➢ The model will indicate the trade-off between risk and reward. ➢ It does not produce an "optimal" level of risk, which will depend on the attitudes of the employer and/or trustees. ➢ Invariably the process of choosing a risk level involves some compromise between the parties involved. ➢ Optimal policies on an ongoing basis may need to be adjusted to reflect the possible impact on discontinuance. ➢ The model may not adequately model some practical aspects e.g. difficulties in selling large property holdings over a short time period.	
	[10]

A5

  i.

   Divergence from assumptions:

- investment return

- general salary increases

- price inflation

- pension increases

- promotional salary scale

- ill-health retirement

- pre-retirement mortality

- post-retirement mortality

- new entrants

- mortality of dependants

- withdrawals

- early/late retirement

- amount commuted

- marital statistics experience.

  Other factors:

- contributions paid different from expected

- change of funding method

- change of basis

- benefit changes

- changes to legislation, eg taxation changes

- surplus carried forward.

ii.

The average return is given by i, solving:

$1350 \times (1+i)^3 + 3 \times (50 - 35) \times (1+i)^{1.5} = 1750$

By trial and error or however, "i" is approximately 8% pa. Assuming that both contribution and benefits payout are uniformly distributed over the period.

This is above what was assumed and must account for some of the surplus that has arisen.

If the expected return had been achieved, we would have assets worth an estimated:

$1350 \times (1.07)^3 + 3 \times (50 - 35) \times (1.07)^{1.5} = 1703.61$

In isolation, this rate of interest has therefore produced a surplus of around Rs. 46 million over the three years against the assumed rate of 7% pa. The total surplus is Rs. 70 million, so it would appear that excluding this item, there is a surplus of Rs. 24 million.

For an ongoing valuation, a discounted value of assets normally gives a more suitable picture. We do not have data to be able to comment on the behaviour if a discounted value of assets was used.

The strong rise in market value might be caused by an increase in dividends (which would increase the discounted value). If however dividends haven't increased, the rise in equity prices would be offset by a reduction in the dividend yield and so there would be no change to the discounted value of the equities.

iii.

There is insufficient data to make a proper analysis.

Average salaries are a useful indication, but it is the salary history for those members with longer past service that is important.

The average salary has risen from Rs. 180, 000 to Rs. 194, 300 – an annual increase of 7.9%.

The overall effect may be a source of surplus or a source of deficit.

For example, if members with larger past service liabilities (eg senior managers, older members) have received higher than average salary increases at the expense of the other members, salary experience would be a source of deficit and vice versa.

[13]

A6

(i)
- Government – Labour department
- Government – Finance department / Treasury
- Government workers
- Regulator
- Employers
- Pension fund managers
- Employees
- Public at large
- Trade Unions

(ii)

- Reduce future accrual
- Close the scheme to new employees and open a Defined contribution scheme
- Make the scheme open to less people by making the eligibility criteria stricter e.g. increase minimum service and age
- Alter the salary definition to make it exclude certain portion of the remuneration (if possible)
- Increase retirement age
- Reduce death benefits
- Increase the vesting criteria
- If applicable reduce / limit the level of pension increases payable in retirement
- Introduce a cap on service and / or benefit accrual
- Introduce a cap on the pensionable salary
- Introduce/increase member contributions

(iii)
- Eligibility criteria for inclusion (i.e. minimum and maximum age)
- Will foreign workers be allowed to contribute
- Minimum and maximum contribution levels
- Retirement age
- Whether funds can withdrawn before retirement
- Form of benefit at retirement (level of lump sum and/or minimum amount to be used for annuitisation)
- Asset choices available to members
- Whether there will be a default choice and how that will look
- Will life styling auto choice be allowed
- How often will investment changes allowed to be made
- Specifying the level of death benefit before retirement
- What will be the charges for the scheme
- What tax treatment will be given to contributions and benefits (e.g. EET or EEE)

(iv)

- How will the scheme be accessible to citizens (What distribution network will the government use). Need to have sufficient accessibility to citizens but keep costs low
- Will employers be able to contribute to members' plans
- Government will have to choose suitable fund managers through a very transparent process
- Fund managers will have to be regulated in terms

- Selling (i.e. no mis selling)
- Disclosure requirements
- Reporting performance
- Accounting norms
- Investment patterns and restrictions
- As it is a voluntary scheme Government will need to market this scheme heavily or ensure good tax benefits to encourage participation
- The administration process needs to be very extensive

[18]

A 7

a)

Accounting Valuations
- The valuation is for accounting purposes to disclose the balance sheet net asset/liability position as well as the expense to be included as part of the P&L
- Accounting valuations generally based on best estimate assumptions
- Financial Assumptions will be related to the market environment (e.g. market yields for discount rates)
- Assets would be taken at market value
- The actuarial method is generally prescribed by the accounting standards applicable
- The accounting principles of going concern and accruals are borne in mind for the approach to the valuation method and setting of assumptions

Funding valuations
- Funding Valuations will be performed to assess the long term health/financial status of the scheme and also to determine the contributions to be paid to the scheme

- Conducting funding valuations may be dictated by the Trust Deed and/or regulation
- The assumptions could be chosen on a prudent basis
- The assumptions could also be chosen bearing in mind the long term and are not necessarily market related
- Asset valuation method must be consistent with the liability measurement method
- Assets could be valued on book value, assessed value or market value
- The valuation liability method can be chosen and is usually not restricted

Discontinuance valuations
- Discontinuance valuations are to assess the adequacy of the scheme funds to meet the benefit liabilities assuming that the scheme was closed on the valuation date
- The liability assumption basis would need to consistent with the method of discharging the benefits on such an event
- Need to bear in mind that Trust Rules may specify any special treatment of benefits on discontinuance e.g. allowance for leaving service benefits, discretionary benefits
- The assets would be taken at the surrender/bid value
- Setting transfer values
- In order to set transfer value bases for scheme members, the affordability of the basis can be assessed by conducting a valuation on that basis.
- Transfer value bases may be determined by legislation and so it would be more important to assess the affordability and decide if such transfer values should be reduced (if allowed by Trust Deed and legislation)

b)

- What does any Trust Deed say on the level of contributions
- What does any Trust Deed say regarding who has the power of deciding the level of contributions to be paid: Trustees and/or Company
- What does any pension legislation require regarding the minimum level of contributions and how does the amount being proposed compare to that.
- Is there a maximum level of contributions that can be paid
- How do the tax laws impact the level of contributions. There may be a maximum amount that can be claimed as a tax deductible expense for tax purposes
- The valuation was for accounting purposes so how applicable is the deficit position from a long term funding perspective. How far do the assumptions such as discount rate differ from a long term rate.
- Does the company want to immediately fund to 100% of this best estimate basis?
- Does it have flexibility in the length of time it can make good that deficit
- Company may want to pay more if it has some cashflow available and the net tax comparable returns that the company can achieve through the trust may be more than keeping the money in the company
- Company may want to pay more if it feels that it is a good message to give staff regarding the security of their scheme
- In addition to the deficit there is the ongoing cost of the accrual that needs to be contributed for as well
- All these factors will need to be considered to decide how much is contributed
- Is the company going to alter its investment strategy at all and so expects the deficit to reduce by higher longer term returns
- Company needs to ensure it does not fund too much as it may well be that money cannot be returned to the company in the case of any future surpluses being declared

c)

Contributions will still be required in the future for the following reasons:
- As members accrue benefits through future service their ongoing cost of accrual will need to be met with future contributions
- Being a defined benefit scheme the actual cost of benefits accrued is not known with certainty. It means that value placed as the deficit in the current valuation may change in the future due to various reasons such as

 - Change of assumptions
 - Change in valuation methodology
 - Experience turning out to be different than assumed in our valuations like
      salary growth
      attrition, mortality
      asset return performance
- There may be change in legislation in the future requiring a higher level of funding and therefore contributions
- If the scheme is closed in the future then there may be a different measure (solvency for example) of the solvency of the fund and legislation may dictate that any shortfall at that time is made good before the scheme is closed/wound up
- If scheme benefits are enhanced for the past service then further contributions would be needed to meet that additional cost

[20]

A8

(i) Three methods of calculating the future contribution rates

Projected Unit Method (PUM)

The contribution rate is set as the level required to meet the liabilities that will accrue over the next year (with suitable full allowance for future salary increases).

Contribution for Retirement/withdrawal benefit part:

1/40* Present Value (PV) of 1* salary accruing next year /current salary

$$\frac{\frac{1}{40} * 22.4}{33} = 1.60\%$$

Contribution for Death benefit part:

1.5* Present Value (PV) of 1* salary accruing next year /current salary

$$\frac{1.5 * 0.14}{33} = 0.60\%$$

Total Contribution rate = 1.60% + 0.60% = 2.20%

Attained Age Method (AAM)

The contribution rate is set as the present value of total liabilities for future service divided by the present value of future salaries for all current members. Thus this rate paid over the future should cover all future service liabilities for current membership.

Contribution for Retirement/withdrawal benefit part:

1/40* PV of 1* salary on retirement or withdrawal/PV of salary up to exit

$$\frac{\frac{1}{40} * 448.3}{640.3} = 1.75\%$$

Contribution for Death benefit part:

1.5* Present Value (PV) of 1* salary accruing next year /current salary

$$\frac{1.5 * 3.85}{640.3} = 0.90\%$$

Total Contribution rate = 1.75% + 0.90% = 2.65%

Entry Age Method (EAM)

The contribution rate is equal to the rate required to provide all the future benefits of typical new entrant.

Assume the entry age as 30 years

Contribution for Retirement/withdrawal benefit part:

1/40* PV of 1* salary on retirement or withdrawal/PV of salary up to exit

$$\frac{\frac{1}{40} * 319.35}{465.95} = 1.71\%$$

Contribution for Death benefit part:

1.5* Present Value (PV) of 1* salary accruing next year /current salary

$$\frac{1.3 \times 2.74}{405.95} = 0.88\%$$

Total Contribution rate = 1.71% + 0.88% = 2.59%

(ii)

The suitability of a funding method is usually assessed by reference to each of the following:

- **Security** – the ability of a funding method to ensure that there will be sufficient assets to meet a scheme's liabilities

- **Stability** – the stability of the rate of payment is said to be stable if there are no fluctuations in the experience affecting the benefits or investments. In other words, the extent to which the funding of the plan remains stable when the flow of new entrants dries up or changes substantially in some other way.

- **Realism** – the method is not realistic if its underlying assumptions are unlikely to be met in practice

- **Flexibility** – the flexibility is achieved by using a method that targets a good level of security whilst not running a large risk of breaching any statutory maximum level.

Each of the funding methods described above is satisfactory in all these respects. It should however be noted that the scheme size will probably be small, which will possibly give rise to greater volatility. The PUM is only stable if the average age doesn't change which may be unlikely for such a small scheme.

If the scheme is expected to retain the same age/sex/salary structure, the PUM may be more suitable. If it is expected to age, the AAM may be more suitable. If it is likely to be swamped by new entrants, the EAM may be most suitable.

If the average age of the membership were to increase, the PUM rate would increase gradually, the AAM future service rate would also increase to but to a lesser extent. Also the increase in the AAM SCR would be offset by a surplus in the scheme, which would allow a stable overall contribution rate if the other assumptions were met.

Unless the assumed average age at entry is changed, the EAM rate above would not change.

All methods are unrealistic to a greater extent because some of the implicit assumptions are not borne out in practice except where the approach used for setting assumptions deliberately counteracts market movements.

The EAM may lead to constraints on the employer. The large target fund leads to the greatest risk of surplus funds and enforced actions.

The use of the PUM or the AAM is less likely to result in a breach of statutory minima or maxima. The flexibility may therefore be greater than EAM.

[20]

Total Marks **[100]**

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